

CLAIMS

1. A system for focusing electromagnetic energy on a target comprising:
first means for providing a pilot beam of electromagnetic energy;
second means for receiving a wavefront due to a reflection of said pilot beam
from said target;

5 third means for analyzing said received wavefront from said target and providing
data in response thereto; and

fourth means for providing an output beam in response to said data which is
predistorted to compensate for distortions and other phase and/or amplitude information
in said received wavefront whereby said output beam is focused at said target.

2. The invention of Claim 1 wherein said first means includes a beacon laser.

3. The invention of Claim 2 wherein said beacon laser is mounted off-axis with
respect to said output beam.

4. The invention of Claim 1 wherein said second means includes a telescope.

5. The invention of Claim 4 wherein said telescope is gimbaled.

6. The invention of Claim 5 wherein said second means further includes a
detector in optical alignment with said telescope.

7. The invention of Claim 6 wherein said second means further includes a track
processor in communication with said detector.

8. The invention of Claim 1 wherein said third means includes a wavefront error
sensor.

9. The invention of Claim 8 wherein said fourth means includes means for providing an output beam which is a phase conjugate of said received wavefront.

10. The invention of Claim 9 wherein said fourth means includes a deformable mirror.

11. The invention of Claim 10 wherein said fourth means includes mirror control means responsive to said wavefront sensor for controlling said deformable mirror.

12. The invention of Claim 11 wherein said fourth means includes a laser for illuminating said deformable mirror to provide said output beam.

13. The invention of Claim 12 wherein said fourth means further includes means for modulating said output beam.

14. The invention of Claim 13 wherein said means for modulating includes means for detecting a modulation in a beam received from the target.

15. The invention of Claim 14 wherein said means for modulating further includes a closed-loop system controller responsive to said means for detecting a modulation.

16. The invention of Claim 15 wherein said means for modulating includes an electro-optic shutter disposed in the path of the output of said laser and responsive to said closed-loop system controller.

17. The invention of Claim 16 wherein said means for modulating includes means for controlling said deformable mirror to effect a modulation of said output beam.

18. The invention of Claim 1 wherein said third means and said fourth means are implemented with an optical phase conjugate mirror.

19. A system for focusing electromagnetic energy on a target comprising:

first means for analyzing a received wavefront and providing data in response thereto, said wavefront being provided by star light and wavefront distortions being due to the atmosphere and

5 second means for providing an output beam in response to said data which is predistorted to compensate for said distortions and other phase and/or amplitude information in said wavefront whereby said output beam is focused at a target.

20. The invention of Claim 19 wherein said first means includes a wavefront error sensor.

21. The invention of Claim 20 wherein said wavefront error sensor is adapted to detect distortions in star light and other phase and/or amplitude information in said wavefront induced by the atmosphere.

22. The invention of Claim 21 wherein said second means includes a deformable mirror.

23. The invention of Claim 22 wherein said wavefront error sensor includes means for controlling said deformable mirror to predistort said output beam whereby said output beam is focused by said atmosphere at a target.

24. The invention of Claim 23 wherein said second means includes a laser for illuminating said deformable mirror to provide said output beam.

25. The invention of Claim 24 wherein said second means further includes

means for modulating said output beam.

26. The invention of Claim 25 wherein said means for modulating includes means for detecting a modulation in a beam received from the target.

27. The invention of Claim 26 wherein said means for modulating further includes a closed-loop system controller responsive to said means for detecting a modulation.

28. The invention of Claim 27 wherein said means for modulating includes an electro-optic shutter disposed in the path of the output of said laser and responsive to said closed-loop system controller.

29. The invention of Claim 19 wherein said first means and said second means are implemented with an optical phase conjugate mirror.

30. A method for focusing electromagnetic energy on a target including the steps of:

providing a pilot beam of electromagnetic energy;

receiving a wavefront due to a reflection of said pilot beam from said target;

5 analyzing distortions in said received wavefront from said target and providing data in response thereto; and

providing an output beam in response to said data which is predistorted to compensate for said distortions and other phase and/or amplitude information in said wavefront whereby said output beam is focused at said target.